

Input/Output
<Keypad Driver>
<LCD>

Compile(Build) and Burn Batch Files

Compile.bat

```
@echo off
```

```
avr-gcc -Os -DF_CPU=16000000UL -mmcu=atmega328p -c -o out.o xxxxx.c
```

```
avr-gcc -mmcu=atmega328p out.o -o out
```

```
avr-objcopy -O ihex -R .eeprom out out.hex
```

```
pause
```

Compile(Build) and Burn Batch Files

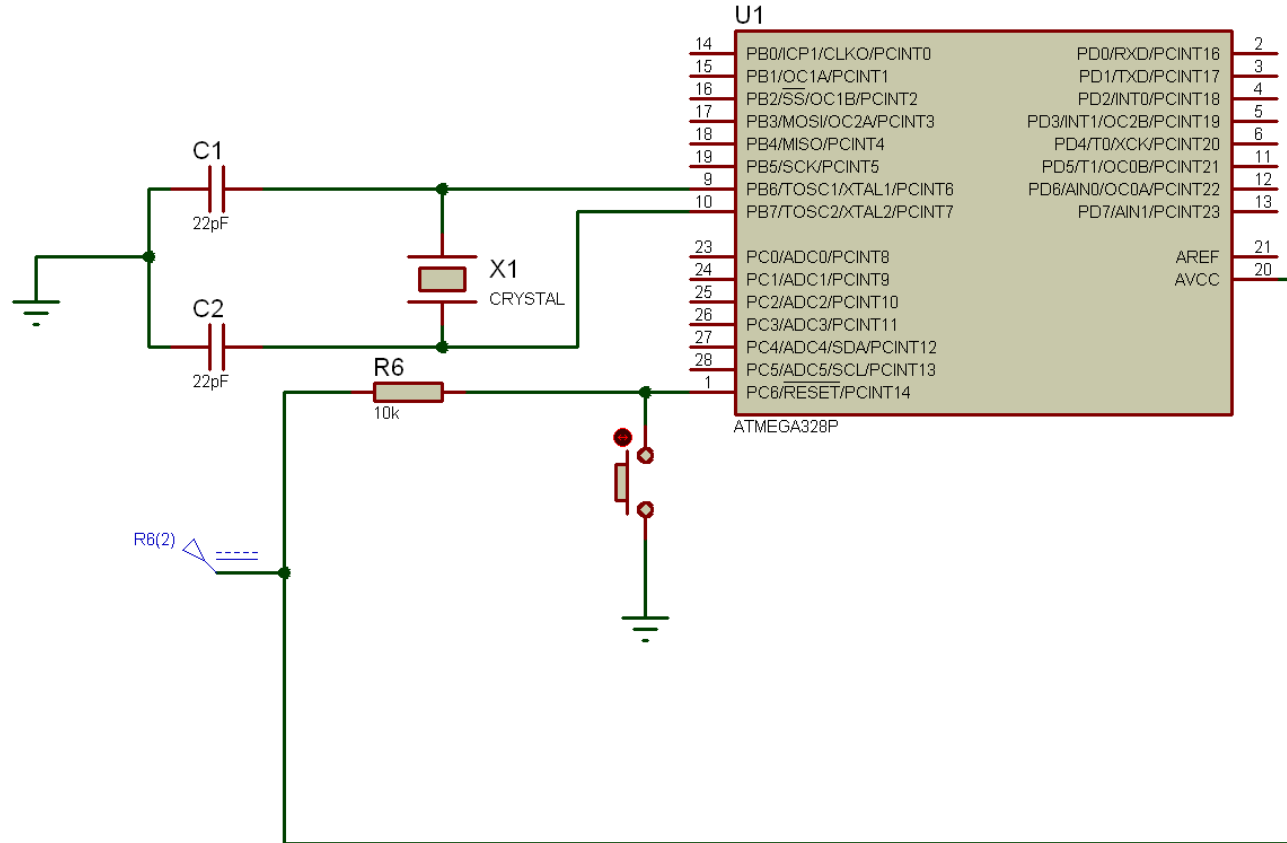
burn.bat

@echo off

avrdude -F -V -c arduino -p ATMEGA328P -P COM* -b 115200 -U flash:w:out.hex

pause

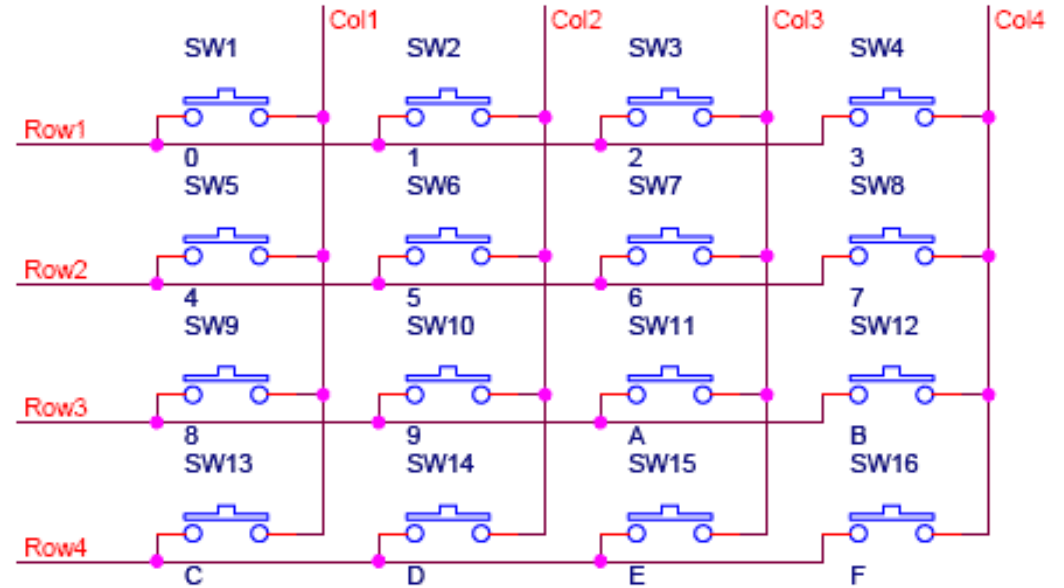
MCU Essential Connections



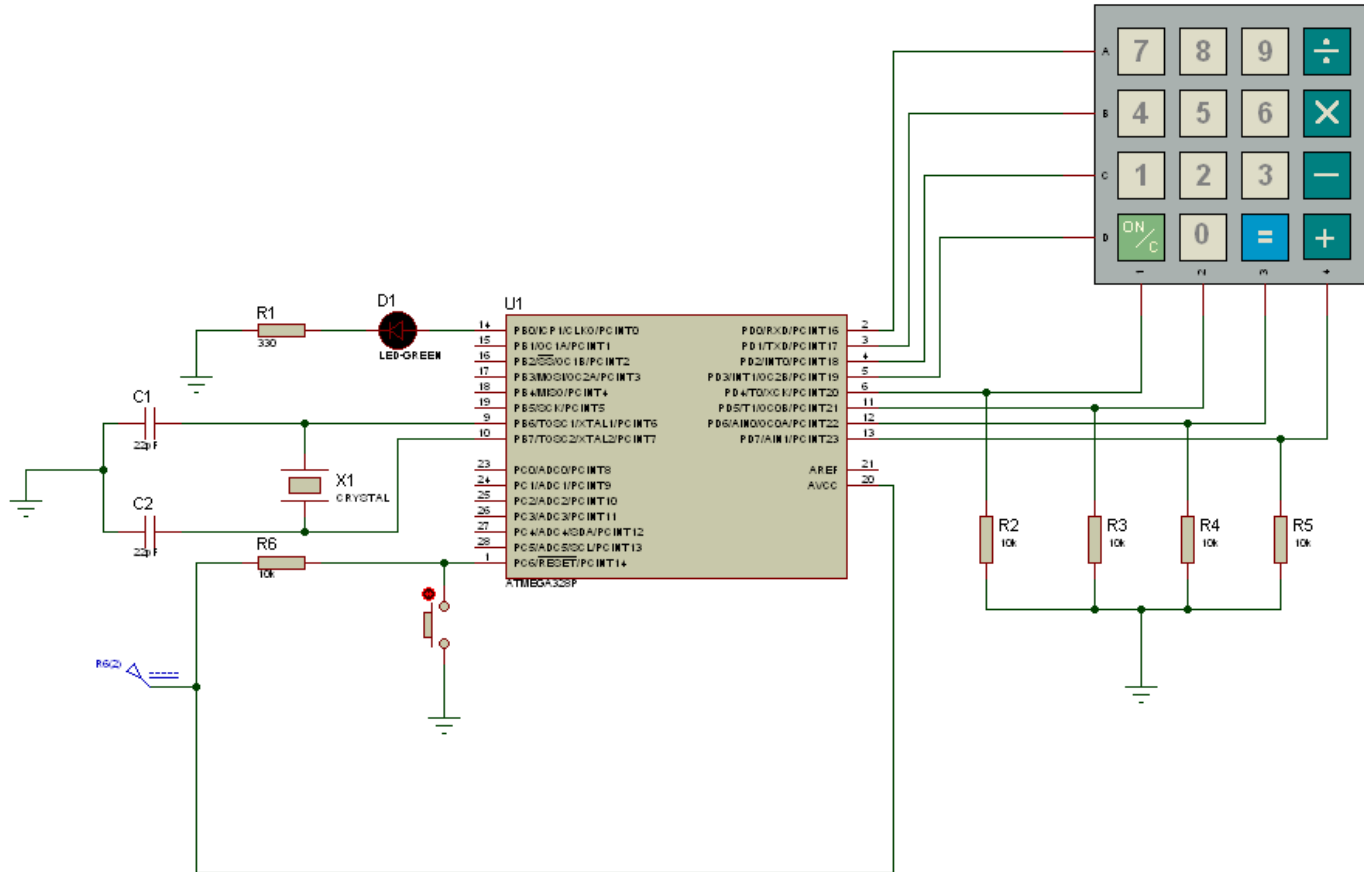
What is Keypad?



What is Keypad?



Keypad Driver



Keypad Driver

```
PORTD=0b00000001;  
    if((PIND&0b00010000)==0b00010000) character='7';  
    if((PIND&0b00100000)==0b00100000) character='8';  
    if((PIND&0b01000000)==0b01000000) character='9';  
    if((PIND&0b10000000)==0b10000000) character='/';
```


Keypad Driver

```
PORTD=0b00000010;  
    if((PIND&0b00010000)==0b00010000) character='4';  
    if((PIND&0b00100000)==0b00100000) character='5';  
    if((PIND&0b01000000)==0b01000000) character='6';  
    if((PIND&0b10000000)==0b10000000) character='*';
```

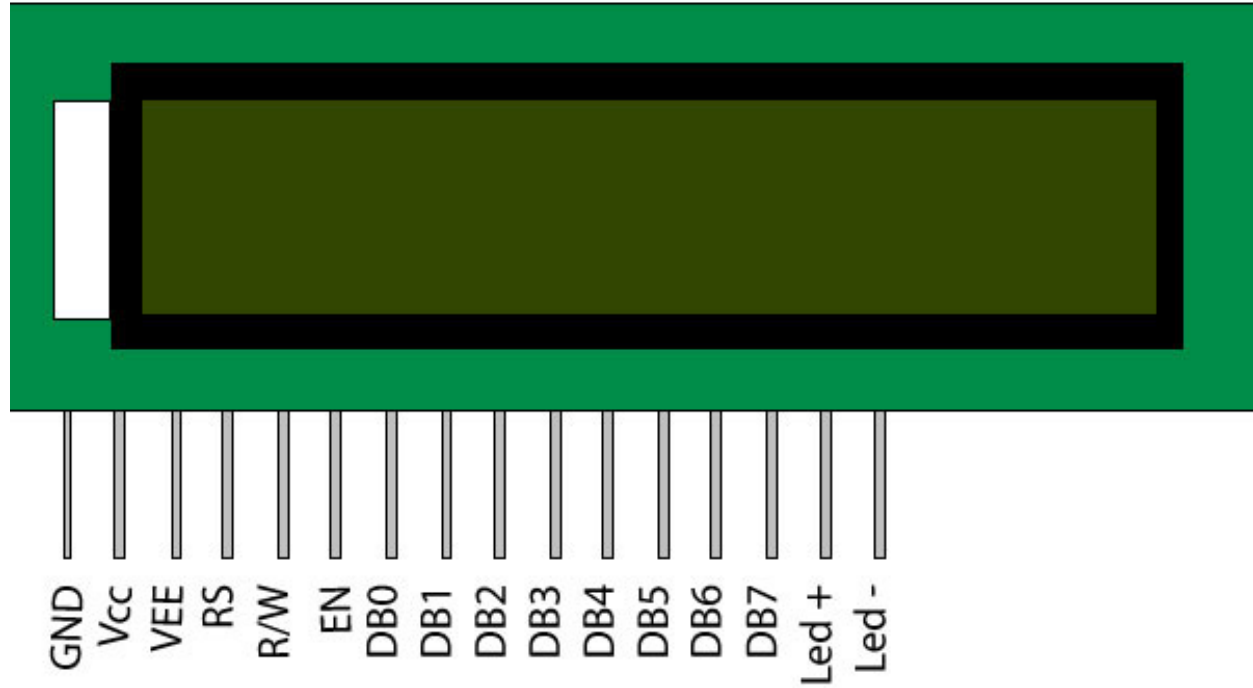
Keypad Driver

```
PORTD=0b00000100;  
    if((PIND&0b00010000)==0b00010000) character='1';  
    if((PIND&0b00100000)==0b00100000) character='2';  
    if((PIND&0b01000000)==0b01000000) character='3';  
    if((PIND&0b10000000)==0b10000000) character='-';
```

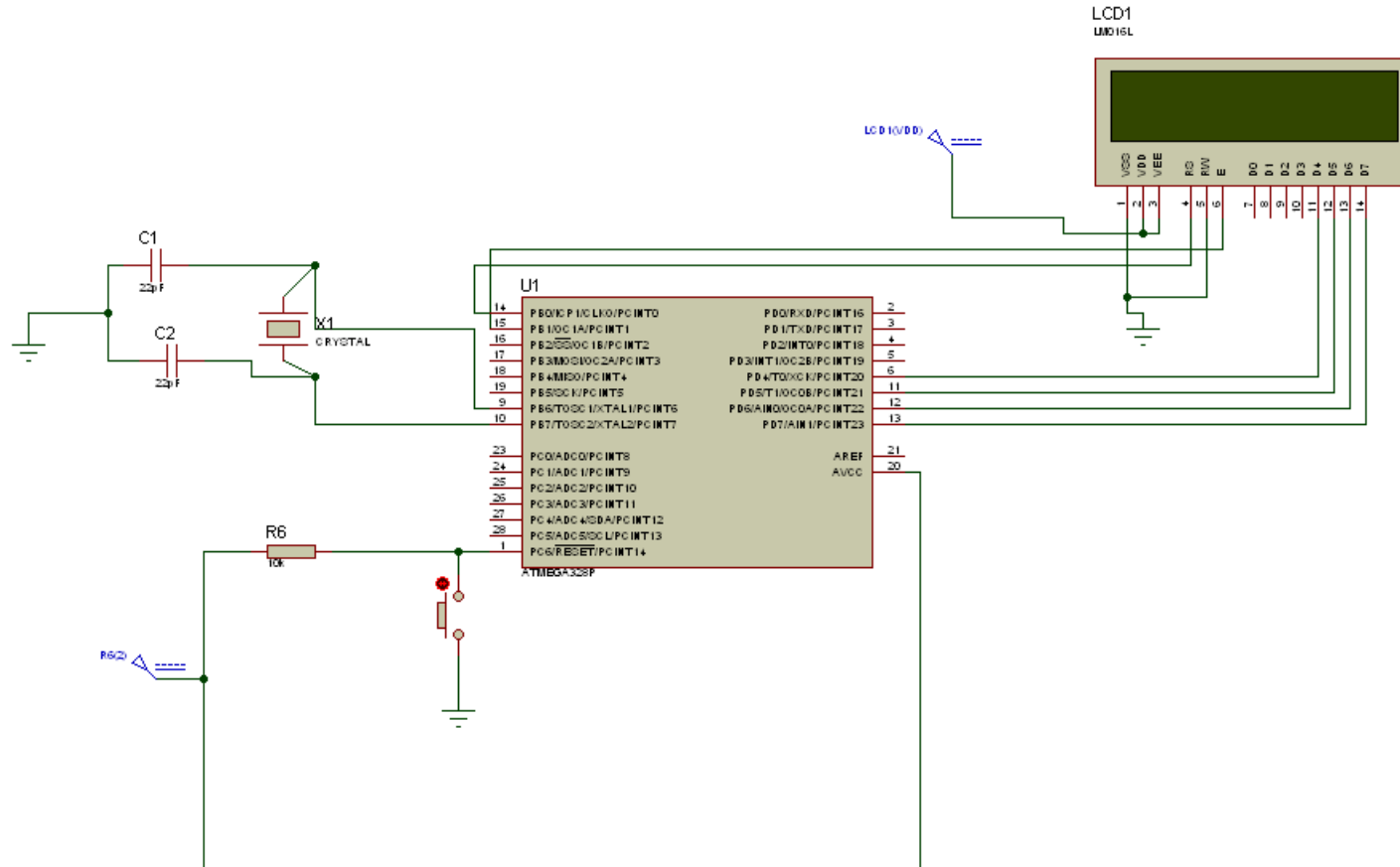
Keypad Driver

```
PORTD=0b00001000;  
    if((PIND&0b00010000)==0b00010000) character='o';  
    if((PIND&0b00100000)==0b00100000) character='0';  
    if((PIND&0b01000000)==0b01000000) character='=';  
    if((PIND&0b10000000)==0b10000000) character='+';
```

What is LCD screen?



LCD Screen Driver



LCD Screen Driver

```
lcd_init_4d();
```

```
lcd_write_string_4d("IEEE Tanta SB");
```

```
lcd_write_instruction_4d(lcd_SetCursor | lcd_LineTwo);  
_delay_us(80);
```

```
lcd_write_string_4d("Embedded Systems");
```

Thanks